

# Public knowledge, attitudes and practice toward bystander cardiopulmonary resuscitation in Saudi Arabia, a cross-sectional study

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**ABSTRACT**

The “out-of-hospital cardiac arrest” is a term used to describe the event of heart activity cessation that occurs in a setting that is outside of a healthcare center. The bystander cardiopulmonary resuscitation and the induction of the life-saving sequence are mandatory to increase the chance of survival for a victim of cardiac arrest. However, the general public is still in lag in their knowledge in cardiopulmonary resuscitation and hesitates to offer help due to the low number of certified basic life support candidates. Moreover, witnessing a live management of a cardiac arrest event could be a potential influential motive for an individual to attempt acquiring the basic life support skills.

**Keywords:** Cardiopulmonary resuscitation, Basic life support, Emergency, Cardiac Arrest

**1. INTRODUCTION**

The event of cardiac arrest is a result of blood flow loss sequence leading to sudden stop of the heartbeat activity, and if left untreated within a window of minutes; usually causing death. Since the 1960s, the closed chest cardiopulmonary resuscitation is a life-saving technique that can save patients' lives who have suffered of a cardiac arrest event. Despite the survival rate escalation in patients suffering from cardiovascular diseases, the out-of-hospital cardiac arrests (OHCA) survival rate has not yet increased; with the cardiopulmonary resuscitation (CPR) being one topmost significant factor that highly impacts the chance of survival in an OHCA incidence (Song et al., 2018).

OHCA is a term that describes the state of heart mechanical activity cessation occurring in a situation outside of the hospital. It is considered to be one of the public health problems that are considerably reversible. An important role in the overall management of OHCA is contributed by the chain of early CPR and the advanced care. Moreover, the bystander CPR and its initiation through the basic life support are capable of increasing the chance of the survival from the event by two or three times. The skill of CPR is commonly acquired by the staff in the health care professions and medical doctors, however; previous studies targeting health care staff have shown relatively poor knowledge on the CPR with the general population having even poorer knowledge (Mani et al., 2015).

Our conducted project has assessed the different perceptions among the general population on the concept of CPR and whether future plans on establishing the skill is present or not present yet. On top, this study focuses on establishing stake holders for the future in regards of providing more basic life support courses and establishes higher levels of awareness.

## 2. METHODS AND MATERIALS

This study is a cross-sectional type of research that was conducted from the date of the 8<sup>th</sup> of July, 2021 through the 7<sup>th</sup> of October, 2021 period. A sample that is typically representative of the general population was targeted to participate in this cross-sectional study. The aim established throughout the study falls under the umbrella of assessing the knowledge and the attitudes along with the perceptions of the general population on the skills of CPR with the future opinions. The questionnaire was designed through Google Documents surveys to be utilized as a self-administered survey; moreover, it was sent through the social networks for easy accessibility and approach. The data was collected based on a validated questionnaire that was established by the study authors to be fit and valid to fulfill the aimed objectives of this study. We divided the participants based on their gender in some of the questions and based on whether they know about the CPR or not. Upon that, only non-medical field working participants' responses were investigated in this study with the exclusion of medical field staff responses. The study was approved by the institutional review board (IRB) at King Fahad Medical City in Riyadh, Saudi Arabia. Additionally, an informed consent of approving the participation in the self-administered electronic survey was obtained from all the study subjects.

### Data Collection and Sample size

The questionnaire involved a total of 18 questions. The conducted questions were categorized under three parts. The first part included sociodemographic information such as the gender, age of the participant, educational level, work field, and their knowledge on CPR. The second part of the survey was designed to assess the attitudes and practices toward the CPR skills. Lastly, the third part has assessed the future willingness in participating in CPR courses and more questions that can build a base for future healthcare and educational projects. Moreover, the study had included 400 participants of both genders with the majority being female.

### Statistical analysis

Regarding the frequencies and the percentages used for nominal variables, a chi-square non-parametric test was conducted to assess the significance among the responses. The SPSS IBM V28 analysis program was used for the data analysis.

## 3. RESULTS

A total of 400 participants have completed the survey, most of the study participants are females (n= 287, 71.8%) and (n=113, 28.2%) male subjects. Moreover, most of them were in a college educational level (n=233, 58.3%) and high school students (n=132, 33.0%). Regarding the age perspective, we have categorized the age of the subjects as: 15-20 years, 21-25 years, 26-30 years, and above 30 years with most of the study participants being above 30 years of age (n=116, 29.0%). We have initially asked the participants where they know about the CPR or not, most of them have mentioned that they know about the CPR (n= 248, 62.0%), while (n=152, 38.0%) have mentioned that they do not know about it. Of the total, only (n=60, 15.0%) have been previously trained to perform the CPR. The baseline sociodemographic data is reported in (Table 1).

**Table 1** Baseline demographic data of the participants.

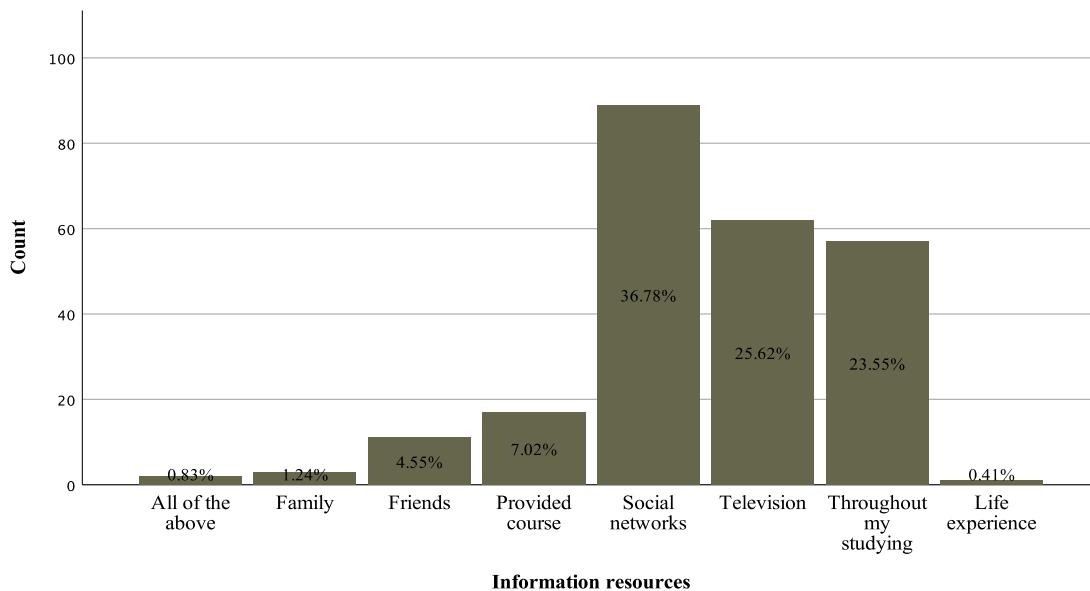
Variable	N (%) (n=400)
Gender	
Female	287 (71.8%)
Male	113 (28.2%)

<i>Age</i>	
15-20 years	150 (37.5%)
21-25 years	75 (18.8%)
26-30 years	59 (14.8%)
Above 30 years	116 (29.0%)
<i>Educational level</i>	
Middle school	4 (1.0%)
High school	132 (33.0%)
College	233 (58.3%)
Diploma	31 (7.8%)
<i>Do you know about "Cardiopulmonary Resuscitation"?</i>	
Yes	248 (62.0%)
No	152 (38.0%)

Of those who stated that they do not know about the CPR (n=152), 17.1% of them believed that CPR skills are only limited for healthcare practitioners, while of those who mentioned that they know about the CPR (n=243), only 4.0% believed it is limited to the healthcare staff. A chi-square goodness of fit test was used to test whether the belief differed from randomness, which have showed statistically significant difference between the subgroups ( $X^2 = 19.66$ ,  $p<0.001$ ) with a Fisher's exact test that is significant in addition ( $p<0.001$ ).

#### Comparison between attitudes and information resources of participants who have witnessed vs. have not witnessed CPR

Of the total study subjects, 141 of them have previously witnessed a live CPR performed, (35.5%, n=50) of them have reported that they have seen cardiac arrest victims surviving after a CPR session. However, (83.7%, n=118) have stated that they have not previously seen someone dying after the conduction of CPR. Of those, 75.2% have not been previously trained on CPR skills, while only 24.8% were trained. In addition, 97.9% of them are willing to perform CPR if they were in the incidence. Assessing their information resources, only 12.8% did not have resource for information as they did not have knowledge on CPR, while all the others had. "Social networks" was the far most top option as an information source (36.78%), followed by television (25.62%), and studying (23.55%), (Figure 1).



**Figure 1** The information resources the participants have gained their knowledge from regarding the CPR skills.

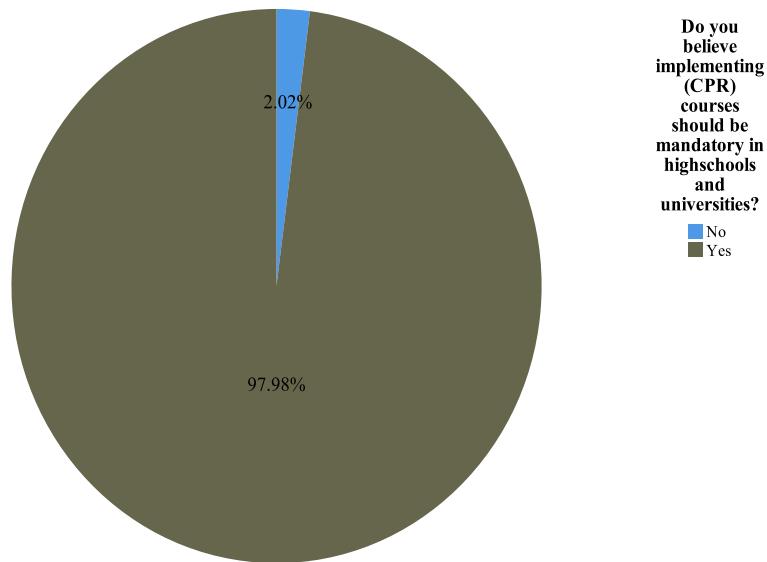
We have assessed a comparison between the responses of those who have witnessed previous CPR performance in an event and those who have not. Of those who have not witnessed (n=259), 90.3% of them are not trained to perform CPR; with only 13.1% of them believing that the CPR is limited for healthcare workers. However, 96.1% have stated that they would perform CPR in needed

events if they were certified. Additionally, we have investigated the information sources in those who have never witnessed a CPR, we found that 45.2% have no resources, 24.3% knew about it from social networks, and 13.0% have used the television.

### Future Implementations in Saudi Arabia

We have assessed the willingness of performing CPR in needed scenarios if the participant was certified and a chi-square test was implemented to appreciate the presence of statistical significance. Of those who have believed that the general public should be concise with the knowledge of CPR skills, (97.4%, n=382) stated that they will be willing to perform CPR in needed cases if they were certified while only (2.6%, n=10) denied willing to perform it. A chi-square goodness of fit test was used to test whether the willingness differed from randomness. The expected frequencies in all of the cells were greater than five. Most of the participants who believe the public should learn the skills have the desire to perform their CPR skills which has differed statistically from those who are unwilling  $X^2 = 316.08, p<0.001$ .

Furthermore, this study had investigated the general public's attitude towards the implementation of CPR training courses. Most of the participants have agreed that they believe that CPR courses should be mandatory to be implemented in high schools and in college as well (95.3%, n=381), while only (4.8%, n=19) showed negative response (Figure 2) The study authors believe that considering the public's responses towards this matter reflects on the future implementations and adjustments, and the results of this project can create the stakeholders for the future plans in healthcare systems and educational systems in collaboration. The rest of the responses between the two categories of subjects are listed in (Table 2) with their correlated chi-square fitness test and significance.



**Figure 2** A pie chart describing the enthusiasm expressed by the participants when asked whether they believe that future implementation of CPR courses in schools and colleges is necessary

**Table 2** Comparison between the responses of the participants who have witnessed a live CPR and those who have not

Assessing Question	I have previously witnessed a CPR. (N=141)		I have not previously witnessed a CPR. (N=259)	
	Yes	No	Yes	No
Do you know about the CPR?	123 (87.2%)	18 (12.8%)	125 (48.3%)	134 (51.7%)
Have you been previously trained to perform CPR?	35 (24.8%)	106 (75.2%)	25 (9.7%)	234 (90.3%)
Are any of your family members a patient who suffers from cardiovascular disease?	52 (36.9%)	89 (63.1%)	97 (37.5%)	162 (62.5%)
Do you believe that CPR is only limited to healthcare staff?	2 (1.4%)	139 (98.6%)	34 (13.1%)	225 (86.9%)

Do you believe that it is important for the general public to gain the CPR skills?	141 (100.0%)	0 (0.0%)	251 (96.9%)	8 (3.1%)
Will you be willing to perform CPR when needed if you were certified?	138 (97.9%)	3 (2.1%)	249 (96.1%)	10 (3.9%)
Would you apply for CPR training if courses were offered for free?	134 (95.0%)	7 (5.0%)	242 (93.4%)	17 (6.6%)
Do you believe implementing CPR courses should be mandatory in high schools and universities?	139 (98.6%)	2 (1.4%)	242 (93.4%)	17 (6.6%)

#### 4. DISCUSSION

This study project aims to investigate and provide an overview of Saudi Arabia public's knowledge and perception along with the attitudes regarding the BCPR and its education and experience in our country along with the willingness of obtaining the skills and performing them in the required incidences. CPR is the baseline integral aspect of cardiac arrest initial, approach and management. The optimum definition of CPR has undergone multiple changes throughout the past years. The delivery of the appropriate recommended approach and CPR procedure can be essentially vital to the overall prognosis and outcome of the resuscitated patient (Abella, 2016). CPR is considered the single most important element in the management of out-of-hospital cardiac arrest. Studies of recent years have considerably demonstrated the correlation between the quality of the CPR and the survival outcome of the resuscitated patient (Ong, 2011). The components of cardiopulmonary resuscitation involve the establishment of a patent airway, ventilation, chest compression, and cardiac defibrillation in certain circumstances (Yu et al., 2020). Medical practitioners should be aware of the possible adverse events that can result from CPR. Although like most medical procedures, CPR can be associated with various adverse events that can vary from skin lacerations to rhabdomyolysis-induced kidney injury (Ihnát et al., 2014). The survival rate depends on various factors based on the past and present medical history. The 30-day survival rate of patients undergoing CPR after an in-hospital cardiac arrest is reduced as the age is increased (Hirlekar et al., 2017). Trauma patients tend to have a poor survival rate after CPR, yet, the outcome is positively correlated with the timeline interval between presentation and CPR (Elkbuli et al., 2018).

Cardiac arrest is a leading cause of mortality in the western world. Epidemiological studies have shown a significant increment in the rates of knowledge and successful procedural outcome, yet, the rate of public awareness about the steps of CPR is still to be relatively low (Hanassi et al., 2020). In a given study, the results highlighted the presence of a correlation between barriers towards the procedures and general awareness. Barriers that can contribute towards a lesser public awareness include the fear of patient injury during the CPR (57%) (Hanassi et al., 2020), in retrospect, the presence and development of Cardio-pulmonary resuscitation was a highlighted part of medical practice (Al-Turkistani, 2014). In a cross-sectional analysis that was conducted in Khobar, Saudi Arabia, it was concluded that CPR-based knowledge is not sufficiently prevalent (Al-Turkistani, 2014).

CPR training can be considered an integral aspect of medical training. Most medical students are aware of the importance of CPR, yet, the awareness about the steps and recommended management is not fully comprehended. It is recommended that training should be established via intervals of training (Amberkar, 2014). It is advised that nursing practice students receive interval and updated CPR techniques to ensure technical error identification and correctness (Oermann, 2020). It is impeccable that emergent and correct response to cardiac arrest by nurses contributes to the increased rate of survival. Simulation-based CPR training for nurses has drastically shown an increased rate of successful training and reduced stress in performing the procedure (Sok et al., 2020). In regards to first responders in public settings like malls, out-of-hospital cardiac arrest is usually initially managed by security personnel.

A cross-sectional study was performed to highlight the percentage of awareness and knowledge of security personnel about CPR. The study showed a 7.2% correct rate of knowledge about the compression technique and 24.2% in regards to hand placement (Al Haliq et al., 2020). Among schools, the vast majority of students, teachers, and principals are aware of the essential role of CPR training awareness. A functional method of increasing the awareness and the availability of CPR trainees in the school system is via establishing and implementing awareness CPR-related programs (De Smedt et al., 2019). School students should be introduced to

the concept of bystander CPR via courses with various intervals to enforce public awareness about its vitality and importance (Pivač et al., 2020). Mortality rates caused by cardiac incidents take the lead in between the most common causes of death in Saudi Arabia. It is established that public awareness about the process and procedural steps of CPR training is considered the initial management of cardiac arrest. In a given study, CPR-based awareness evaluation was conducted on non-medical students in King Abdulaziz University, Jeddah. It was concluded that the bases of knowledge among the student population were considerably poor along with the willingness of most students to learn and participate in CPR awareness campaigns (Alnajjar et al., 2020). The establishment of CPR awareness among the public in society can be established by educational programs through social media (Jarrah et al., 2018). Although evidence-based medicine has proven the efficiency of current CPR procedures, there is data-based evidence that improvement is yet to be achieved through awareness via various technological means (Brayet al., 2017).

In accordance to our study results, the authors have found that the rate of the participants who have received previous training on the CPR skills was (n=60, 15.0%). However, this measured rate may vary in the different provinces and from an area to another. Previous studies conducted in different countries to investigate the rate of people who have received CPR training have been reviewed. Among these, it was found that the rate of people who have received previous training in Solvenia is 69.4%, 35% in Japan, 21% in Hong Kong, 75% in Poland, 40.3% in Turkey, 27% in New Zealand, 28% in Ireland, 64.1% in West Australia, and 79% in Washington (Özbilgin et al., 2015). 248 (62.0%) of our study participants have stated that they know about the CPR, with most of them gaining their information from the social network as a resource, followed by television, and information gained throughout studying. However, we can compare the information resources to the previously mentioned countries where the disparate rates are justified by having the BLS as a mandatory required skill in order to apply for certain jobs and before getting the driving license such as in the country of Solvenia and in Turkey (Özbilgin et al., 2015; Rajapakse, 2010). Urban et al., (2013) have mentioned in their study that discontinuation of the compressions process by both of the professional rescuers and the public citizens is because they are not willing to perform the mouth-to-mouth ventilation. Due to the previously mentioned issue, it was recommended to increase the emphasis on the education offered to the rescuers by utilizing the various approaches including videos and different programs. Furthermore, smartphones and the advanced technologies should be utilized to contribute to the education on the CPR (Atkins, 2012).

Our study investigations have shown that the subjects who have had previous training of cardiopulmonary resuscitation have reported a higher level of willingness to conduct the CPR when needed. Interestingly similar to that, Kanstad and colleagues (2011) have reported that the participants who have the skills of performing CPR have showed greater confidence in the desire of performing CPR if in an event of need. However, the study done by Kanstad et al., (2011) has recommended in their conclusion that even though young people in Norway are motivated to perform the CPR; barriers still exist as burdens. Thereby, it is recommended to implement BLS training and provide it in high quality fashion in schools for a brighter future generation. We, in addition, throughout the study process, recommend providing BLS courses to the general population and educate them as it will strengthen the OHCA initial step in the “chain of survival”. Moreover, we have found that (n=381, 95.3%) of the study participants have agreed that the implementation of cardiopulmonary resuscitation training courses is necessary in learning facilities such as schools for instance.

According to our study results, 141 participants of the study subjects have noted that they have previously witnessed or attended a real-life CPR. Interestingly, all of those who have witnessed the event believe that the general public should learn the CPR skills. Justifying upon our results, a study conducted by Hawkes et al., (2018) have reported that witnessing OHCA is associated with a higher likelihood of willingness to obtain the skills of support and resuscitation and implement them in needed scenarios. Moreover, investigating through our study responses, we have found that more males (97.3%) are willing to perform the CPR if they were certified; however, this rate has not varied from the number of females who are willing to perform it if they were certified (96.5%). This is compared to Hawkes et al., (2018) study that reported an association between female gender and more likeliness to train for the CPR skills, and a younger age that positively correlates with it in further addition. Despite all, the authors believe that more research should be conducted to study the different demographics interactions and the variable barriers that could potentially exist.

Regarding additional future recommendations; interestingly, 376 (94.0%) of the study participants have mentioned that they will be willing to participate in CPR training courses if they were offered for free, while only 24 (6.0%) have disagreed ( $p<0.001$ ). This result gives us a glance about the future projects that could be implemented in the Kingdom of Saudi Arabia. Regarding that, we recommend that the national healthcare centers and the educational programs start investigating through the future implementation of free CPR training courses. This will consequently increase the number of certified trainees and could hopefully decrease the number of cardiac arrest victims by increasing their survival rate.

## 5. CONCLUSION

Our study project provides evidence that suggests that future implementation of free and near-to-reach CPR training courses are necessary and most of the general populations are enthusiastic about it. Moreover, we believe that making the CPR as obligatory in certain workplaces will increase the number of certified trainees. In conclusion, increasing the number of trainees, by implementing the courses in high schools and universities or making them mandatory skills to start a job will increase the survival rate for OHCA victims. Additionally, ever since most participants use the social networks to gain information on CPR, we believe that conducting more awareness through the media will help reaching the general public and informing them more efficiently.

### Authors' Contributions

Sami Alamrihas participated in this study by writing down the abstract and reviewing the whole article. Meaad Khan was responsible for instructing the participants and writing down the introduction. Ahmed Almalki & Talal Alotaibi have explained and written down the methodology. Alhassan Ahmed & Muath Alraddadi has statistically analyzed the data collected. Ziad Albalwi has written down the discussion. Omniah Altemani & Sara Alswayed have collected and written down the references.

### Acknowledgments

We thank the participants who were all contributed samples to the study.

### Ethical approval

The study was approved by the Medical Ethics Committee of King Fahad Medical City (ethical approval code: 21-245E).

### Funding

This study has not received any external funding.

### Conflict of Interest

The authors declare that there are no conflicts of interests.

### Data and materials availability

All data associated with this study are presented in the paper. Further inquiries can be directed to the corresponding author.

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